REMARKS

Claims 1, 2 and 4-11 are pending in this application. By this Amendment, Applicant amends claims 1, 2 and 4-11, and cancels claim 3.

The Examiner's indication that claim 5 would be allowable if rewritten in independent form including all of the features of the base claim and any intervening claims is greatly appreciated.

The Abstract was objected to for containing the word "means". Applicant has amended the Abstract to replace the word "means" with --mechanism--. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this objection.

Claims 2, 3, 5 and 7-11 were rejected under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite. Applicant has amended the claims to correct the informalities noted by the Examiner. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 1-3, 6/1-3, 7/1-3, 8/1-3, and 10/1-3 were rejected under 35 U.S.C. § 102(e) as being anticipated by Touge et al. (U.S. 6,134,961). And claims 4 and 6-11/4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Touge et al. Applicants respectfully traverse this rejection.

Claim 1 has been amended to recites:

> "An angular velocity sensor comprising:
> a substrate;
> an oscillator disposed on the substrate so as to be displaceable relative to the substrate; and
> **impact damping mechanism disposed on the substrate for dampening the effect on oscillations of the oscillator from an impact to the substrate; wherein**
> **said impact damping mechanism is defined by a single unitary member including a portion for damping in a Y-direction and a portion for damping in an X-direction**." (Emphasis added)

The Examiner alleged that Touge et al. teaches all of the features recited in claim 1 including "a damping means 8a, 8b for suppressing the Y-direction vibrations of the oscillator" and that "impact to the substrate 100 would inherently be damped by the damping means 8a, 8b". Applicant respectfully disagrees.

Elements 8a and 8b of Touge et al. are specifically disclosed as being provided to relax the stress due to temperature distortion to prevent adverse effects to the vibration characteristics (see col. 3, line 59 through col. 4, line 2). Touge et al. fails to teach or suggest that the elements 8a and 8b could or would dampen the effect of oscillations of the oscillator from an impact to the substrate. In fact, Touge et al. fails to even recognize that impacts to the substrate could or should be dampened. Thus, Touge et al. clearly fails to teach or suggest an "impact damping mechanism disposed on the substrate **for dampening the effect on oscillations of the oscillator from an impact to the substrate**" (emphasis added) as recited in claim 1 of the present application.

In addition, elements 8a and 8b of Touge et al. are clearly discrete elements which are configured such that they are flexible in the X-direction and highly rigid in the Y-direction. Thus, even assuming *arguendo* that elements 8a and 8b of Touge et al. can be fairly construed as teaching an impact mechanism, at best, the elements 8a and 8b would dampen oscillations in only the Y-direction, and **NOT** in the X-direction. Thus, Touge et al. clearly fails to teach or suggest an impact dampening mechanism that is "defined by a single unitary member including a portion for damping in a Y-direction and a portion for damping in an X-direction" as recited in claim 1 of the present application.

Claim 2 has been amended to recite the features of allowable claim 5 and intervening claim 3. Accordingly, Applicant respectfully submits that claim 2 is allowable as indicated by the Examiner.

Claim 4 has been amended to recite:

"An angular velocity sensor comprising
a substrate;
an impact damping mechanism disposed on the substrate for damping an impact applied to the substrate;
an oscillator supported on the substrate by at least one oscillator support beam, such as to be displaceable in two directions parallel to the substrate and orthogonal to each other;
oscillation-generating mechanism for oscillating the oscillator in an oscillating direction parallel to one of the two directions; and

angular-velocity detecting mechanism for detecting a displacement of the oscillator as an angular velocity when the oscillator is displaced in a detecting direction orthogonal to the oscillating direction,

wherein the impact damping mechanism damps an impact to the substrate along at least one direction of the oscillating direction and the detecting direction so as to prevent the impact from being transferred to the oscillator from the substrate;

the impact damping mechanism is formed of a frame support beam disposed on the substrate and a frame supported to the substrate by the frame support beam so as to displaceable in at least one of the oscillating direction and the detecting direction, and wherein the oscillator is supported on the inside of the frame via the oscillator support beam such as to be displaceable in both of the oscillating direction and the detecting direction; and

the oscillator support beam, and the frame have an entire resonant frequency which is set to be 1/√2 times more than or less than a resonant frequency of the oscillator." (Emphasis added)

As described above, contrary to the Examiner's allegations, Touge et al. fails to teach or suggest an "impact damping mechanism disposed on the substrate for dampening the effect on oscillations of the oscillator from an impact to the substrate" as recited in claim 4 of the present application.

In addition, elements 8a and 8b of Touge et al. are specifically disclosed as being provided to relax the temperature distortion and are **NOT** disclosed as being an impact damping mechanism. Elements 8a and 8b are incapable of reducing the resonant frequency since elements 8a and 8b merely relax the stress (temperature distortion). Thus, Touge et al. clearly fails to teach or suggest "the oscillator support beam, and the frame have an entire resonant frequency which is set to be 1/√2 times more than or less than a resonant frequency of the oscillator" as recited in claim 4 of the present application.

Accordingly, Applicant respectfully submits that Touge et al. fails to teach or suggest the unique combination and arrangement of elements recited in claims 1, 2 and 4 of the present application.

In view of the foregoing Amendments and Remarks, Applicants respectfully submit that Claims 1, 2 and 4 are allowable over the prior art for the reasons described

above. Claims 5-11 are dependent upon claims 1, 2 and 4, and are therefore allowable for at least the reasons that claims 1, 2 and 4 are allowable.

In view of the foregoing Amendments and Remarks, Applicants respectfully submit that this Application is in condition for allowance. Favorable consideration and prompt allowance are respectfully solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Date: October 30, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Abstract:

An angular velocity sensor includes a substrate; an impact damping mechanism disposed on the substrate for damping an impact applied to the substrate; an oscillator supported to the inside of the impact damping mechanism displaceable in two directions parallel to the substrate and orthogonal to each other by using an oscillator support beam; an oscillation-generating [means] mechanism for oscillating the oscillator in an oscillating direction; and an angular-velocity detecting [means] mechanism for detecting a displacement of the oscillator as an angular velocity when the oscillator is displaced in a detection direction orthogonal to the oscillating direction. The impact damping mechanism damps an impact along at least one direction of the oscillating direction and the detecting direction so as to prevent the impact from being transferred to the oscillator from the substrate.

In the Claims:

1. An angular velocity sensor comprising:

a substrate;

an oscillator disposed on the substrate so as to be displaceable relative to the substrate; and

impact damping [means] mechanism disposed on the substrate for dampening the effect on oscillations of the oscillator from an impact to the substrate; wherein

said impact damping mechanism is defined by a single unitary member including a portion for damping in a Y-direction and a portion for damping in an X-direction.

2. An angular velocity sensor comprising:

a substrate;

an impact damping mechanism disposed on the substrate for damping an impact applied to the substrate;

an oscillator supported on the substrate by at least one oscillator support beam, such as to be displaceable in two directions parallel to the substrate and orthogonal to each other;

an oscillation-generating [means] mechanism for oscillating the oscillator in an oscillating direction parallel to one of the two directions; and

an angular-velocity detecting [means] mechanism for detecting a displacement of the oscillator as an angular velocity when the oscillator is displaced in a detecting direction orthogonal to the oscillating direction,

wherein the impact damping mechanism damps an impact to the substrate along at least one direction of the oscillating direction and the detecting direction so as to prevent the impact from being transferred to the oscillator from the substrate;

the impact damping mechanism is formed of a frame support beam disposed on the substrate and a frame supported to the substrate by the frame support beam so as to displaceable in at least one of the oscillating direction and the detecting direction, and wherein the oscillator is supported on the inside of the frame via the oscillator support beam such as to be displaceable in both of the oscillating direction and the detecting direction; and

the substrate is provided with a support section arranged outside the frame so as to surround the frame for supporting the frame via the frame support beam and wherein the impact damping mechanism includes a damping clearance portion arranged between the support section and the frame for compressing a gas when the frame is displaced.

4. An angular velocity sensor [according to claim 3,] comprising:

a substrate;

an impact damping mechanism disposed on the substrate for damping an impact applied to the substrate;

an oscillator supported on the substrate by at least one oscillator support beam, such as to be displaceable in two directions parallel to the substrate and orthogonal to each other;

oscillation-generating mechanism for oscillating the oscillator in an oscillating direction parallel to one of the two directions; and

angular-velocity detecting mechanism for detecting a displacement of the oscillator as an angular velocity when the oscillator is displaced in a detecting direction orthogonal to the oscillating direction,

wherein the impact damping mechanism damps an impact to the substrate along at least one direction of the oscillating direction and the detecting direction so as to prevent the impact from being transferred to the oscillator from the substrate;

the impact damping mechanism is formed of a frame support beam disposed on the substrate and a frame supported to the substrate by the frame support beam so as to displaceable in at least one of the oscillating direction and the detecting direction, and wherein the oscillator is supported on the inside of the frame via the oscillator support beam such as to be displaceable in both of the oscillating direction and the detecting direction; and

the oscillator support beam, and the frame have an entire resonant frequency which is set to be $1/\sqrt{2}$ times more than or less than a resonant frequency of the oscillator.

5. An angular velocity sensor according to [any one of claims 3 and] claim 4, wherein the substrate is provided with a support section arranged outside the frame so as to surround the frame for supporting the frame via the frame support beam and wherein the impact damping mechanism includes a damping clearance portion arranged between the support section and the frame for compressing a gas when the frame is displaced.

6. An angular velocity sensor according to any one of claims 1 [to], 2 or 4, wherein the oscillator is formed to be displaceable in an oscillating direction parallel to the substrate and in a detecting direction orthogonal to the substrate, and wherein the impact damping mechanism is formed so as to damp an impact in the oscillating

direction and to prevent the impact from being transferred to the oscillator from the substrate.

7. An angular velocity sensor according to any one of claims 1 [to], 2 or 4, wherein the oscillator is formed to be displaceable in oscillating and detecting directions parallel to the substrate and orthogonal to each other, and wherein the impact damping mechanism is formed so as to damp an impact in at least one direction of the oscillating and detecting directions and to prevent the impact from being transferred to the oscillator from the substrate.

8. An angular velocity sensor according to anyone of claims 1 [to], 2 or 4, wherein the oscillator, the oscillator support beam, and the impact damping mechanism are unitarily formed by a single-crystalline or polycrystalline silicon material.

9. An angular velocity sensor according to claim 5, wherein the oscillator, the oscillator support beam, and the impact damping mechanism are unitarily formed by a single-crystalline or polycrystalline silicon material [having a low resistance].

10. An angular velocity sensor according to claim 6, wherein the oscillator, the oscillator support beam, and the impact damping mechanism are unitarily formed by a single-crystalline or polycrystalline silicon material [having a low resistance].

11. An angular velocity sensor according to claim 7, wherein the oscillator, the oscillator support beam, and the impact damping mechanism are unitarily formed by a single-crystalline or polycrystalline silicon material [having a low resistance].

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